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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/734,593	12/15/2003	Srivatsa Kundalgurki	543822003300	1431
25227	7590	10/04/2004	EXAMINER	
MORRISON & FOERSTER LLP 1650 TYSONS BOULEVARD SUITE 300 MCLEAN, VA 22102			PERT, EVAN T	
			ART UNIT	PAPER NUMBER
			2829	

DATE MAILED: 10/04/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

**Application No.**

10/734,593

**Applicant(s)**

KUNDALGURKI, SRIVATSA

**Examiner**

Evan Pert

**Art Unit**

2829

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 15 December 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-16 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 December 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948)                                    | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Drawings***

1. The informal drawings are acceptable for examination. Formal drawings will be required when the case is in condition for allowance.

### ***Claim Objections***

2. Claims 3, 4 and 14 are objected to because of grammatical informalities:

In claim 3, nitrogen and hydrogen should not be capitalized and "Nirogen" should read –nitrogen--.

In claim 4, "comprises of" should read –is comprised of--, or an equivalent.

In claim 14, the grammar reading: "...the selectivity of the mask *to the resist*..." does not clearly recite the intended scope because "etch selectivity" is defined as "the etch rate of the target film divided by the etch rate of a reference film." The recited limitation is taken to mean "...the resist has an etch selectivity equal or higher than 10 with the mask taken as a reference," or "...the resist has a selectivity to the mask equal or higher than 10."

Appropriate correction is required.

### ***Claim Rejections - 35 USC § 112***

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1, 9 10 and 12 (as well as depending claims 2-8, 11 and 13-16) are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention, particularly because of ambiguity in claim 1.

Claim 9 recites the limitation "the lithography mask," yet there is insufficient antecedent basis for this limitation in the claim. For purposes of examination, "the lithography mask" is the same as "the mask" recited in claim 1.

Claim 10 recites the limitation "the hard mask," yet there is insufficient antecedent basis for this limitation in the claim. For purposes of examination, "the hard mask" is the same as "the mask" recited in claim 1.

Regarding claims 1 and 12 (as well as all claims depending from claim 1), claim 12 recites the limitation of "the liner comprising of SiON." Yet, there is lack of antecedent basis for "the liner comprising of SiON" in claim 1. Furthermore, the limitation "...is deposited on the mask prior to depositing and stripping the resist" in claim 12 renders claim 1 ambiguous due to the implication by claim 12 that the liner may not have been deposited as *intended* by the preamble of claim 1. For purposes of examination, claim 12 is taken to be equivalent to "the method of claim 1 wherein the liner is SiON" (if the subject matter of the preamble of claim 1 is given patentable weight to limit the claim) or "the method of claim 1 wherein a liner is deposited on the mask prior to depositing and stripping the resist" (with the preamble of claim 1 not being given significant patentable weight).

***Claim Rejections - 35 USC § 102***

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 2, 6, 9, 10, 13, and 15-16 are rejected under 35 U.S.C. 102(e) as being anticipated by Ohuchi et al. (US 2004/0144491 A1), based on the claim interpretation set forth in item 3 above as well as the claim interpretation that follows:

The modifier "predetermined" is used in the claims when reciting claimed "pressure," "temperature," "period," and "amount," yet this modifier does not have significant patentable weight: The quality of being "predetermined" is either a necessary quality of pressures, temperatures and amounts disclosed for semiconductor processing, or "predetermined" is a quality of a nebulous mental step that occurred prior to practice of the method. In the art of semiconductor manufacturing, everything possible is "predetermined," at least to some extent, or else control of the manufacturing process would be undesirably random and uncontrolled. Since applicant has not disclosed anything unique about predetermination, the word "predetermined" in the claims does not have significant patentable weight.

The independent claim (i.e. claim 1) consists of a preamble reciting *intended use* (i.e. "for removing a resist from a liner on a mask on a semiconductor substrate"), but this ambiguous *intention* does not necessarily limit the claim. For purposes of examination, the liner is considered optional and the preamble to claim 1 is considered as being equivalent to: "A method, comprising:", since the "liner" in the preamble does not breath life and meaning into the body of the claim [See MPEP 2111.02].

As a final preliminary note to this rejection, the optional "liner" recited in the claims is interpreted as being "a layer of material" that is formed on and over a hard mask, but under a photoresist, such that the "liner" is a material that is formed between and contacting both an underlying hard mask and an overlying photoresist.

Regarding claim 1, the '491 application discloses a method for removing resist (33) from a liner (32) on a mask (31) on a semiconductor substrate (90), comprising: providing an etching plasma comprising at least hydrogen [0089] at a temperature and a pressure in a reaction chamber [e.g. 0077]; and etching the resist selectively to the mask with the plasma for a period of time [since resist 33 is removed selectively from liner 32 and carbon mask 31 without etching away carbon mask 31].

Regarding claim 2, the '491 application discloses mixing gases of nitrogen and hydrogen, which is a situation where nitrogen is necessarily a "diluent" [0089].

Regarding claim 6, the '491 application discloses the benefits of an etching plasma that is free of oxygen [0008].

Regarding claim 9, mask 31 is a carbon hard mask that is defined by lithography.

Regarding claim 10, mask 31 is a "carbon film."

Regarding claim 13, insulating layer 21 is on a silicon wafer, which is a "Si-substrate."

Regarding claims 15 and 16, the resist is stripped completely so the resist is also "stripped with an across wafer non-uniformity of 0%."

***Allowable Subject Matter***

5. Claims 3-5, 7-8 and 11-12 would be allowable if rewritten to overcome the rejections under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

6. The following is a statement of reasons for the indication of allowable subject matter, which is *not* necessarily *the only* allowable subject matter disclosed, but is notably conclusively allowable subject matter identified by the examiner in the context of an initially ambiguously claimed invention:

The prior art does not disclose removal of resist from an SiON liner on a carbon hard mask wherein the resist is removed from the SiON liner that overlies the carbon mask by an oxygen-free plasma comprising at least hydrogen. While the prior art recognizes advantages of a hydrogen-containing oxygen-free plasma for removal of photoresist [e.g. 0008 in US 2004/0144491 A1], the prior art does not disclose a "liner" of SiON lining a trench and covering a carbon hard mask with a resist on the SiON wherein the resist is removed with an oxygen-free plasma comprising at least hydrogen.

Applicant's invention advantageously eliminates erosion of a carbon hard mask with SiON liner using prior art resist removal procedures depicted in Figs. 2 and 3.

**Conclusion**

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. JP 55-87438 discloses the advantages of etching a photoresist with a plasma comprising at least hydrogen at a certain temperature, pressure and time.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Evan Pert whose telephone number is 571-272-1969.

The examiner can normally be reached on M-F (7:30AM-3:30 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Tokar can be reached on 571-272-1812. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

ETP  
September 28, 2004

  
**EVAN PERT**  
**PRIMARY EXAMINER**